

Automated 3D skeletal segmentation

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Aim: To develop new imaging biomarkers for the assessment of tumour burden to the skeleton from PET/CT images. The first step is to segment the skeleton in the CT images.

Materials and Methods: A completely automated segmentation method based on convolutional neural networks was developed.

50 CT images from patients who had undergone FDG-PET/CT scans were used.

Experienced image readers performed manual segmentations of the skeleton in the CT images. The manual segmentations were used to train the automated segmentation method.

The Sørensen-Dice index was used to quantitatively evaluate the similarity between two segmentations (1.0 indicates perfect agreement).

Results: Mean Sørensen-Dice index automated vs. manual segmentations:

Vertebra Th11=0.86

L1=0.87

L4=0.89

Sacrum-coccyx=0.91

Pelvic bone=0.95

The corresponding index comparing two manual L1 segmentations were 0.87 (same observer) and 0.86 (different observers).

Conclusion: The performance of the automated segmentation method is similar to that of experienced image readers.

In future work we will use this segmentation method for the analysis of PET images based on for example sodium fluoride or choline.